# Improving Precipitation Measurement in ASOS in Support of Aircraft Ground Deicing

**Federal Aviation Administration**

Presented to: FPAW

By: Mark Gunzelman, AvMet Applications
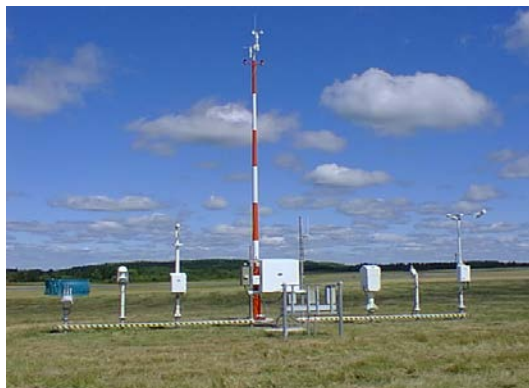
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# Purpose



- **Provide an effective airport weather observation system to support ground anti/de-icing decision making.**

# Problem Statement



**Ground anti/de-icing decision support requires <u>Frequently</u> reported <u>Liquid Water Equivalent</u> (LWE) rate to determine accurate and timely hold-over times**

# Current ASOS Shortfalls Applicable to Snow for Ground De-Icing Operations

- **Special reports (SPECI) are not issued for onset, end, or change in intensity of snow events**

- **Current visibility-based method for snow intensity is not reliable**
  - Must be replaced with LWE for long-term solution
  - Can be improved for an interim solution

# Snow SPECI & FAA Snow Intensity Table

- **Implement, in ASOS:**
  - SPECI for snow beginning, ending, and changing intensity
  - FAA Snow Intensity Table (FSIT) Algorithm
  - Address possible effects of Obstructions-To-Visibility (OTV) on Snow Intensity determination.
    - Assess magnitude of problem
    - If warranted, develop and deploy screening algorithm

# FMH-1 Table vs FAA Snow Intensity Table

| FMH-1 Table | | |
|---|---|---|
| Visibility (Statute Miles) | | |
| > 0.50 | > 0.25 – <= 0.50 | <= 0.25 |
| **Light** | **Moderate** | **Heavy** |

| Time of Day | Temp. Degrees Celsius | Temp. Degrees Fahrenheit | Visibility in Statute Miles (Meters) ≥ 2 1/2 (≥ 4000) | 2 (3200) | 1 3/4 (2800) | 1 1/2 (2400) | 1 1/4 (2000) | 1 (1600) | 3/4 (1200) | 1/2 (800) | <= 1/4 (<= 400) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Day | colder/equal -1 | colder/equal 30 | Very Light | Very Light | *Very Light* | Light | Light | Light | Moderate | Moderate | Heavy | Snowfall Intensity |
| Day | warmer than -1 | warmer than 30 | Very Light | Light | Light | Light | Light | Moderate | Moderate | Heavy | Heavy | Snowfall Intensity |
| Night | colder/equal -1 | colder/equal 30 | Very Light | Light | Light | Moderate | Moderate | Moderate | *Moderate* | Heavy | Heavy | Snowfall Intensity |
| Night | warmer than -1 | warmer than 30 | Very Light | Light | *Moderate* | Moderate | Moderate | *Moderate* | Heavy | Heavy | Heavy | Snowfall Intensity |

# Implement LWE Rate for Snow in ASOS

- **Upgrade All Weather Precipitation Accumulation Gauge (AWPAG) software to determine LWE rate for snow.**

- **Continue use of current ASOS Precipitation Identifier (LEDWI) to detect and report snow**

- Note: LEDWI does not reliably detect Snow Pellets, Freezing Drizzle, and Ice Pellets.

# AWPAG Sensor

- **Implement AWPAG software to determine LWE rate for snow.**

- **Improve AWPAG wind shielding (NWS currently installing Double Alter Snow Shield).**

- **Eliminate sudden snow dumps into gauge.**

# Current LEDWI Sensor

# LWE Rate Benefits

- **Reduce over-estimation of snow intensity rates by pilots resulting in unnecessary delays waiting for weather to improve.**

- **Reduce under-estimation of snow intensity rates by pilot resulting in unnecessary delays incurred by a return to the deicing pad.**

- **Reduces potential precipitation contamination on control surfaces on take-off.**

# Implementation

- **First FAA/NWS will need to update ASOS Operating System software. Planned for FY16-17.**

- **If funding becomes available:**
  - Snow SPECI, FAA Snow Intensity Table, and LWE rate capability for Snow will tentatively be implemented in ASOS beginning in FY17 (after ASOS Operating System is upgraded)

# Backup Slides

# FMH-1 Table vs FAA Snow Intensity Table

| FMH-1 Table | | |
| --- | --- | --- |
| Visibility (Statute Miles) | | |
| > 0.50 | > 0.25 – <= 0.50 | <= 0.25 |
| **Light** | **Moderate** | **Heavy** |

| FAA Snow Intensity Table | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Time of Day** | **Temp** | | **Visibility (Statute Miles)** | | | | | |
| | Degrees Celsius | Degrees Fahrenheit | >1.5 | >1.0 – <= 1.5 | > 0.75 – <= 1.0 | > 0.50 – <= 0.75 | > 0.25 – <= 0.50 | <= 0.25 |
| Day | Colder/Equal to -1 | Colder/Equal to 30 | **Light** | **Light** | **Light** | **Moderate** | **Moderate** | **Heavy** |
| | Warmer than -1 | Warmer than 30 | **Light** | **Light** | **Moderate** | **Moderate** | **Heavy** | **Heavy** |
| Night | Colder/Equal to -1 | Colder/Equal to 30 | **Light** | **Moderate** | **Moderate** | **Heavy** | **Heavy** | **Heavy** |
| | Warmer than -1 | Warmer than 30 | **Light** | **Moderate** | **Heavy** | **Heavy** | **Heavy** | **Heavy** |

# LWE Commercial System

- **Experimental commercial LWE Systems also include GDI decision support systems called Holdover time Determination System (HDS) and Check-Time System (A time-to-fluid expiration algorithm) .**

- **FAA Flight Standards Service is considering issuance of draft standards and an advisory circular for a commercial system.**

# ASOS Sensor Pad